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Tay-Sachs disease: Diagnostic, modeling and treatment approaches

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Abstract

© 2020, Human Stem Cell Institute. All rights reserved. Tay-Sachs disease (OMIM 272800) belongs to the group of autosomal-recessive disorders, caused by β-hexosaminidase A (HexA) enzyme deficiency, resulting in GM2-ganglioside accumu-lation in nervous and other tissues of the body. Enzyme deficiency is caused by various mutations in HEXA gene. Clinical symptom severity depends on residual HexA enzymatic activity associated with some mutations. Currently, there is no effective treatment for Tay-Sachs disease. There are clinical reports of substrate reduction therapy, bone marrow or umbilical cord blood transplanta-tion. However, the therapeutic efficacy of these methods remains insufficient to prevent aggravation of neurological symptoms in Tay-Sachs disease patients. Encouraging results were obtained using gene therapy to deliver wild-type genes encoding the α and β subunits of HexA. This review discusses the therapeutic strategies in Tay-Sachs disease treatment, as well as diagnostic methods and existing animal models to evaluate the effectiveness of new approaches for Tay-Sachs disease therapy.

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Keywords

Bone marrow transplantation, Gene therapy, GM2-gangliosidosis, Inflammation, Lysosomal storage diseases, Neurodegeneration, Tay-Sachs disease, β-hexosaminidase

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